REMARKS

After entry of this Amendment, claims 1, 3–5, 7–9, and 11–16 will be pending; claims 3–5 and 11–13 have been withdrawn in response to a restriction requirement, and claims 2 and 10 have been cancelled. Claim 1 has been amended to recite the limitation of cancelled claims 2 and 6, and claim 9 has been amended to recite the limitation of cancelled claim 10. No new matter has been added.

Rejection of claims under 35 U.S.C. 102

Claims 1, 6–9, and 14–16 are rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,198,269 to Swartz et al. ("Swartz").

The examiner appears to consider the first sol-gel perovskite layer of Swartz to be an optical buffer layer, equivalent to the optical buffer layer recited in amended claim 1. The first sol-gel perovskite layer disclosed by Swartz, however, is provided to enable the formation of a second perovskite layer with better crystallinity, and which crystallizes at a lower temperature and/or with shorter times. Indeed, given their high indices of refraction, the recommended layers "selected to produce [upon heat treatment] a perovskite of: lead titanate ($PbTiO_3$), or strontium titanate ($SrTiO_3$)" would not serve as optical buffer layers, i.e., would not confine the light within the modified barium titanate. *See* column 3, line 41 – column 4, line 7. Swartz does not teach or suggest modified barium titanate deposited on a substrate with an optical buffer layer, as recited in amended independent claim 1. Applicants submit that for at least this reason, amended claim 1 and claims dependent therefrom are patentable over the cited art.

Swartz does not teach or suggest depositing a modified barium titanate on a surface of a substrate, as recited in independent claim 9. Rather, Swartz appears to disclose forming ferroelectric perovskites, such as strontium barium titanate ($(Sr,Ba)TiO_3$) or barium titanate zirconate ($Ba(Ti, Zr)O_3$), by depositing sol-gel precursor layers, and performing a heat treatment to crystallize the sol-gel precursors. *See* abstract. Applicants submit that for at least this reason, independent claim 9 and claims dependent therefrom are patentable over the cited art.

Claims 1, 6–9, and 14–16 are rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 6,103,008 to McKee et al. ("McKee"). McKee appears to disclose a structure including a thin film of the perovskite $BaTiO_3$, as well as the formation of such structure. In some embodiments, Zr or Hf may be substituted on the A site for barium in ABO_3 material. *See* column 2, line 59 – column 3, line 3. McKee does not teach or suggest a structure including barium titanate in which Ti is substituted with Zr on the B site, i.e., modified barium titanate comprising barium titanate including 2 to 20 mol% of Zr ($BaZrO_3$), as recited in amended independent claim 1. McKee also does not teach or suggest forming such structure, as recited in amended independent claim 9. Applicants submit that for at least these reasons, amended independent claims 1 and 9 and claims dependent therefrom are patentable over the cited art.

Rejection of Claims Under 35 U.S.C. 103(a)

Claims 2 and 10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over McKee in view of Rehrig et al., "Piezoelectric properties of zirconium-doped barium titanate single crystals grown by templated grain growth," *Journal of Applied Physics*, Vol. 86, No. 2, August 1, 1999, pages 1657–1661 ("Rehrig"). The limitations of claims 2 and 10 have been added to claims 1 and 9, respectively, and claims 2 and 10 have been cancelled. The examiner concedes that McKee does not disclose modified barium titanate comprising 2 to 20 mol% of Zr ($BaZrO_3$), as now recited in claims 1 and 9, and relies on Rehrig to teach thin films including these compositions. Rehrig discloses the formation of single crystals of $Ba(Zr_xTi_{1-x})O_3$ for sensor and actuator applications. *See* abstract and page 1657, first column, first paragraph and second column, second paragraph. Rehrig does not teach or suggest the formation of thin films including modified barium titanate. Rather, Rehrig discloses the formation of single crystals. One of skill in the art would find no motivation in the cited references to substitute the barium titanate thin film of McKee intended for electro-optical applications with the single crystal of Rehrig intended for sensor and actuator applications. The teachings of these two references are not combinable because the formation of bulk single crystals by templated grain growth, as taught by Rehrig, is inconsistent with the formation of thin films on semiconductor substrates by, e.g., epitaxy, as taught by McKee. Moreover, even if one were to somehow combine the barium

titanate single crystal of Rehrig with the structure of McKee, one still would not obtain the modified barium titanate thin film recited in amended independent claims 1 and 9. Rather, one would have a modified barium titanate single crystal disposed on a substrate, and not a thin film. Neither reference, alone or in combination, teaches a modified barium titanate thin film comprising barium titanate including 2 to 20 mol% of $Zr(BaZrO_3)$. Applicants submit that for at least these reasons, claims 1 and 9 and claims dependent therefrom are patentable.

Claims 2 and 10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Swartz in view of Rehrig. The limitations of claims 2 and 10 have been added to claims 1 and 9, respectively, and claims 2 and 10 have been cancelled. The examiner concedes that Swartz does not disclose modified barium titanate comprising 2 to 20 mol% of Zr ($BaZrO_3$), as now recited in claims 1 and 9, and relies on Rehrig to teach thin films including such compositions. Once again, Rehrig does not teach or suggest the formation of thin films including modified barium titanate. Rather, Rehrig discloses the formation of single crystals. One of skill in the art would find no motivation in the cited references to substitute the barium titanate thin film of Swartz formed from a sol-gel precursor with the single crystal of Rehrig formed by templated grain growth. The single crystal grown by Rehrig is not compatible with the sol-gel process of Swartz used for the formation of thin films. Moreover, even if one were to somehow combine the barium titanate single crystal of Rehrig with the structure of Swartz, one still would not obtain the modified barium titanate thin film recited in amended independent claims 1 and 9. Rather, one would have a modified barium titanate single crystal disposed on a substrate, and not a thin film. Applicants submit that for at least these reasons, claims 1 and 9 and claims dependent therefrom are patentable.

CONCLUSION

In light of the foregoing, Applicants respectfully submit that all claims are now in condition for allowance.

If the Examiner believes that a telephone conversation with Applicants' attorney would expedite allowance of this application, the Examiner is cordially invited to call the undersigned attorney at (617) 570-1806.

A petition for a one-month extension of time and a check for the extension of time fee are enclosed. Applicants believe that no other fee is due for filing of this amendment. However, if any additional fee is due, please charge said fee occasioned by this paper to our Deposit Account No. 07-1700.

Also filed herewith is a copy of a Notification Regarding Small Entity Status and related papers that are being submitted to the U.S. Patent and Trademark Office under separate cover.

Respectfully submitted,

Date: Sept. 29, 2005
Reg. No. 44,381

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